

FORENSIC EVIDENCE IN CRIMINAL CASE ATTRITION

Jovana Vujošević, MSc, FSC

Božidar Banović, PhD¹

Faculty of Security Studies, University of Belgrade, Serbia

Abstract: It is well established that the forensic evidence presence in the Criminal Justice System brings complex questions regarding its collection, impact on legal outcomes, and interpretation by forensic specialists and judges. The paper presents research from the Anglo-Saxon legal doctrine (UK and USA) and the opinion of the U.S. Supreme Court on the admissibility of forensic evidence in criminal proceedings, since it was not the subject of research in the domestic scientific and professional community. Illustrating forensic evidence presence and the attrition process, we were able to highlight potential differences between subgroups in this interdisciplinary community (law enforcement, forensic specialists, and court members). Deficient funding and research opportunities in correlation with a lack of engagement with new technologies, absence of sufficient databases are main issues while trying to establish contribution of forensic evidence in legal outcomes. By bringing scientists, the judge members, police and forensic science practitioners together, we are creating bright-spots of activity in an effort to properly address the issues as a community.

Keywords: Forensics, Legal evidence, Attrition, Criminal Justice System

INTRODUCTION

There is wide interest in establishing how forensic cases advance through the Criminal Justice System. This paper is written to improve understanding and help in the minimisation of attrition (cases discontinued which do not result in a criminal conviction) in forensic evidence cases, in order to advise future policy development. Attrition is not an equivalent to an incident that did not happen, but rather the evidence in the criminal case was not sufficient from a prosecution viewpoint (Hester, 2005; Burton, et al., 2012).

¹ banovicb@fb.bg.ac.rs

Forensic science is the application of science in a crime investigation and court proceedings, which consists of crime scene investigation and the collection, documentation, analysis, interpretation of potential evidence such as fingerprints, biological evidence, digital evidence, drug analyses and footwear marks (Burrows, et al., 2005; Home Office, 2016).

The study examines forensic evidence stance at three stages: report, police investigation, and court hearings. For us to understand forensic evidence importance at court and its contribution towards legal outcome, it is necessary to explore each stage of forensic evidence presence. In that manner, we will be able to methodically approach each difficulty and propose new methods.

If the forensic science is providing numerous analyses which help in Criminal Justice System, why are statistics not showing any particular progress? The main issue is *which, why* and *how* forensic evidence is presented and explained at court proceedings.

The contribution of scene examination and forensic techniques

It is established that quality of initial instruction on preservation, the available resources to examine crime scenes and procedures concerning forensic attendance are affecting the retrieval rate. So far there is not any statistical analysis combining attendance rates and retrieval rates, within particular crime types (Burrows, et al., 2005; Bradbury & Feist, 2005).

Resource allocation is a constant issue when it comes to collecting and analysing physical evidence. Knowing which evidence type has the best chance of increasing the odds of an arrest and a conviction would allow for a more informed way of deciding which types of cases to send crime scene investigators to and what kind of evidence they should focus on (Schroeder & Elink-Schuurman-Laura, 2017).

Peterson, Sommers, Baskin, & Johnson (2010) suggested the prioritizing forensic evidence analysis as method of backlog reduction and creating the analysis process to be more efficient to the requests of the criminal justice system. First of all, forensic evidence should be analysed in relation to arrest and conviction rates for a significant amount of cases within all offence categories – assault, burglary, homicide, rape and robbery. Once each type of forensic evidence has been connected with higher arrest and conviction rates for every offence category, an analysis of other related variables will be used to rule out any other variables which may account for these correlations. Finally, a prognostic statement of probable efficacy can then be designed and assigned to any incoming evidence given the type of evidence and the type of investigated offence. The gathered findings from the mentioned results can advise investigators and crime laboratories in prioritizing the analyses of any forensic evidence (Table 1). In that manner, crime laboratory

information and management systems (LIMS) would be improved (Schroeder & Elink-Schuurman-Laura, 2017).

These are the main steps from Peterson et al. (2010) protocol:

1. Percentage estimate of crime scenes from which various types of forensic evidence are collected;
2. Description and registry of all collected forensic evidence at crime scenes;
3. Following the use and attrition of forensic evidence during crime scenes examination, laboratory analyses, and criminal justice processes;
4. Establishing which types of forensic evidence contribute more often (in relation to their presence at a crime scene) to successful criminal case outcomes.

Table 1. *Forensic evidence stages by offence*

Study	Collection (%)	Submission (%)	Examination (%)	Report generated
Homicide				
Study 1*	97.0	88.5	81.0	-
Study 2*	91.6	98.6	85.2	82.9
Assault				
Study 1	30.3	11.9	9.2	-
Study 2	5.3	99.0	82.7	82.7
Robbery				
Study 1	24.8	10.9	9.9	-
Study 2	6.3	98.9	86.3	86.2
Rape				
Study 1	63.8	32.2	18.6	-
Study 2	66.4	97.7	84.5	84.5
Burglary				
Study 1	19.6	13.0	9.2	-
Study 2	5.5	99.3	84.8	84.9

*Study 1 - Peterson et al., 2010.

*Study 2 - Schroeder & Elink-Schuurman-Laura, 2017.

All types of evidence have a small number of cases with timely reports, which shows the scarcity of case outcomes directly influenced by what the forensic evidence states to the investigator or courts. This suggests that whatever impact physical evidence has on a case, it does not directly come from the information that evidence examination can provide to an investigation (Schroeder & Elink-Schuurman-Laura, 2017).

Expenditure for forensic crime scene analysis should be given higher priority over the increased collection of evidence. Further developments in DNA detection rates depend on increasing crime scene collection rates and establishing full usage of the material collected (Nuffield Council on Bioethics, 2007). Furthermore, lack of forensic facilities and expertise result in low rates of forensic examinations and documented evidence; which later influences the possibility of conviction (Lovett & Kelly, 2009).

Several studies have noted a difference in the utilization of forensic evidence from city to city. These differences include how much evidence is collected for a specific crime type as well as what evidence type investigators focus on for that particular crime type (Schroeder & Elink-Schuurman-Laura, 2017). For example, process mapping in diverse cities indicated that taking ten prints and buccal swabs was sometimes overlooked while a suspect was being held in custody. This results in some poor DNA hits and fingerprint identification rates by numbers of incidents, despite relatively high rates of scene attendance (Burrows, et al., 2005). In addition, Peterson et al. (2010) showed low rates of examination for biological evidence in assault cases while this study shows biological evidence examination was the second only to weapon/firearm evidence.

Scene attendance practices obviously have a very marked impact on the benefits obtained from forensic science (Figure 1). The research literature also shows that while fingerprints tend to be collected more regularly at crime scenes than DNA, the differences between the two techniques are reduced when the greater relative likelihood of DNA samples obtaining a match from the DNA database is taken into account. Equally, it seems that in larger cities, whilst effective and efficient in obtaining DNA evidence, is missing potential fingerprint identification (Burrows, et al., 2005).

Police investigation

The investigation phase is a significant point of attrition. Prosecution have put emphasis on incomplete and delayed submissions of forensic evidence in volume crime cases. Mutually, law enforcement and court members were critical of insufficient forensic awareness of officers (Bradbury & Feist, 2005).

There should be amended recordings of police data regarding DNA matches and the statistical improvement for informing crime justice stakeholders and the wider public. The statistics would also contribute with examination of the cost-effectiveness of the scientific usage of bio-information and may deliver evidence as

to whether infringements on the liberty, privacy and autonomy of individuals are justified (Nuffield Council on Bioethics, 2007). The primary aim is to produce a serious crime database that would organise data from a sample of case files relating to criminal offences (Burton, et al., 2012).

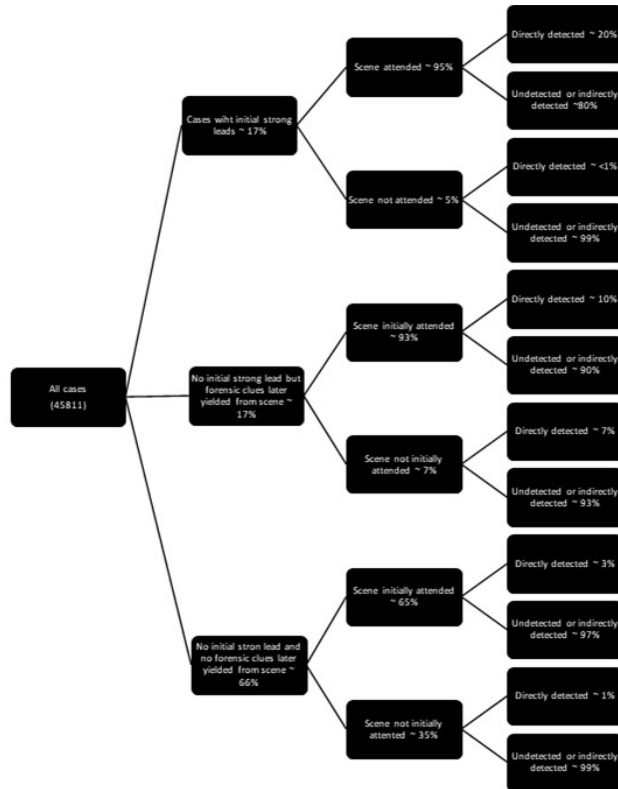


Fig. 1: Summary of cases with strong leads, no initial strong leads, but forensic clues were later obtained, and no initial strong lead and no forensic clues (John Burrows et al, 2005).

Forensic specialists' views on how case handling could be improved included clear leadership from experienced officers. This was seen in gathering reliable detailed evidence, particularly in the early stages of a case. An emphasis is placed on the investigating officer who has responsibility in criminal case; and the role of specialist officers for sexual offences as a model of good practice (Burton, et al., 2012). This was not meant as a criticism of either inspectors or response officers, but rather as a priority from a management perspective (Leane, Ryan, Fennell, & Egan, 2001; Daeid, Cole, & Marra, 2019).

Police forces could enhance knowledge and skills of forensic science through associations with universities within developing a strategy for the review and development of national police forensic learning from crime scene to court (Home Office, 2016).

Why cases fail to proceed through the criminal process to result in a conviction (attrition)?

Regardless of the complexity and difficulty with identification of cause and effect, there are common themes (investment of extensive resources; difficult or impossible identification), issues and references through research and attrition analyses of criminal cases (Leane, et al., 2001). The main idea relates to the perception of forensic evidence as a rather legal than scientific evidence, with leading study being focused on whether and how forensic evidence impacts on legal outcome in criminal cases (such as charge, prosecution, or conviction) (Quadara, Fileborn, & Parkinson, 2013).

Despite having a high probability of detection (Figure 2), the first concern is failed identification of a suspect through forensic linking, due to their absence from database or legitimate access. The second most common cause relates to the quality of available evidence (Burrows et al, 2005, Bradbury & Feist, 2005). All mentioned would lead to “no further action” (NFA) decisions due to insufficient evidence (Burton, et al., 2012).

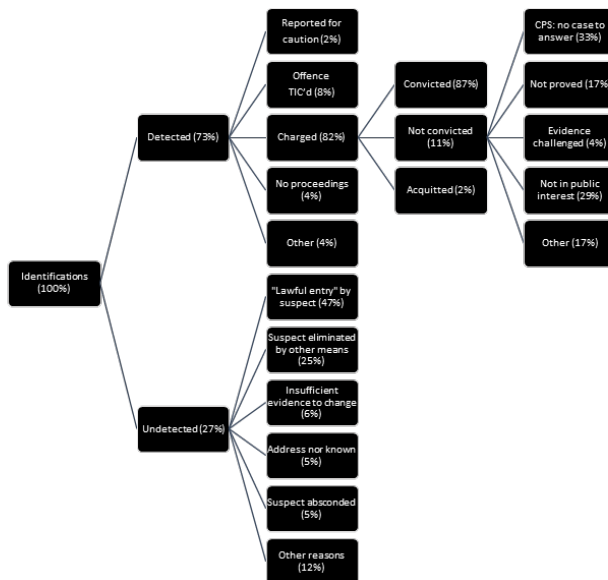


Figure 2. Attrition through the forensic process, from identification to conviction presented as simplified version of the results of the police, prosecution and court data collection exercises (Bradbury & Feist, 2005)

Regardless of the rising expectations of forensic evidence, the empirical research is not conclusive whether forensic evidence by itself has a definitive role in, or in association with positive legal outcomes (Burrows, et al., 2005). It is true that prosecutors are more likely to file charges when forensic evidence is present against the suspect. But, while some studies conclude that forensic evidence is

associated with arrest and charge, others have determined an association between forensic evidence and conviction (whether through plea or verdict) (Quadara, et. al, 2013).

Firstly, not all forms of forensic evidence is equally examined and presented. While DNA evidence specifically can identify an individual with a high level of certainty, and associate an individual to a crime scene, it is not always apparent how an individual's DNA has come to be at a crime scene. Likewise, on the subject of sexual offences, DNA evidence is unable to testify about the issue of consent, even though it can help in establishing that a sexual act has occurred. Thus, DNA and other biological evidence alone are generally not sufficient evidence to found a conviction on, and classify as one of numerous supportive evidence presented by the prosecution in court (Haesler, 2006). Even the evidence of the victim's resistance and the evidence of the defendant's force do not provide legal proof of non-consent (Quadara, et. al, 2013).

Due to these examples, biological evidence is not usually perceived as main impact on legal outcomes. Oppositely, evidence of injury is frequently associated with a positive legal outcome (Quadara, et. al, 2013). Besides, studies report that weapons, firearm and trace evidence do not significantly influence the odds of arrest for assault cases. While other scientists have concluded that weapons, firearm and fingerprint evidence have no impact on conviction. The inconsistent report statements are a result of insufficient number of cases with evidence reports (Schroeder & Elink-Schuurman-Laura, 2017).

Nevertheless, the presence of laboratory reports has great impact on the conviction for murder, theft and burglary charges. For rape cases, the absence of a laboratory report produces 50% decrease of conviction rates than when a lab report is present (Bradbury & Feist, 2005).

Therefore, we have determined these main challenging questions:

Evidence definition — dependency on forensic evidence by investigators and prosecutors to signal “a strong case” at the expense of other forms evidence (Burrows, et al., 2005).

Evidentiary sufficiency — if the availability of forensic evidence is a starting point for offence matters to proceed (Briody, 2002-03; Lievore, 2004).

Public interest - seriousness of the offence, and the likelihood of the perpetrator re-offending (Quadara, et. al., 2013; Lievore, 2004).

Does forensic evidence equals “legal evidence”?

Two demands should guide admission and use of forensic evidence in the court room: the extent to which a specific forensic discipline is based on a consistent scientific methodology; and the extent to which specialists in a specific forensic discipline that relies on interpretation could be fouled by error, the risk of bias, or the absence of effective procedures and strong performance standards (National Academy of Sciences, 2009). That is, is the expert witness qualified to

testify about the particular forensic evidence under examination and is the evidence sufficiently reliable to forensic specialist knowledge and reliance on it in making judgements about legal liability (Quadara, et. al., 2013).

To be credible in court, experts must be not only experts in their field, but also be experts in presenting evidence. Accurate presentation of complex scientific and statistical information to a non-scientific listeners, can be particularly difficult. Professionals (including judges) working within the criminal justice system should acquire a minimum standard of understanding of statistics, particularly with regard to DNA evidence. Judges need to ensure that evidence in its statistical presentation are accurately adhered during trials. For instance, The Royal Statistical Society (RSS) in the United Kingdom has intervened in cases where statistics was misrepresented during trials (Nuffield Council on Bioethics, 2007).

All cases where bio-information evidence is presented, introductory information should be offered to panel of judge's members, to ensure basic understanding of the capabilities, and also the limitations, of such evidence. Moreover, question on the contribution of bio-information to criminal justice requires more thorough research, especially as regards its interference with the autonomy and liberty of society members. In particular, information is required on how and why DNA matches may eventually translate (or not) into convictions in various situations, and for different offences (Nuffield Council on Bioethics, 2007; Daeid, Cole, & Marra, 2019).

Therefore, there is a need for a transparent and strict accreditation and oversight body for a forensic specialist on field and in laboratories, because, unfortunately, experts testifying on areas beyond their expertise have been widely reported in the courts worldwide (Nuffield Council on Bioethics, 2007). Each crime laboratory needs to have established clear and definite management and work procedures, as well as, cost analysis of forensic evidence. In Serbia the accreditation of forensic laboratories, as an authority of the EU, involves the application of European standards of ISO/IEC17025 in forensic laboratories and ISO 17020 for forensic examination at crime scenes (Ivanović & Ivanović, 2013).

For that reason, the U.S. Supreme Court purposed following issues to determine the admissibility of scientific evidence (Fisher, 2016):

- Has the technique been tested in field and laboratory conditions?
- Has the technique been subject to scientific review and publication?
- Has the technique been commonly accepted within the specific scientific community?
- What is potential rate of error?
- What are the control standards of the technique operation?

Another subject for consideration is how we are expressing levels of certainty.

The necessity for answering these particular demands also comes from studies which have found that rather than resulting in an increase in guilty pleas, there has instead been a change in defence tactics towards the question of science re-

liability rather than one of offender identity (Briody, 2002-03; Quadara, et. al., 2013).

Forensic evidence and The “CSI Effect”

This raised question as to whether individuals who watch crime shows develop inaccurate or unrealistic understandings of the uses and accuracy of forensic evidence, otherwise referred to as the CSI Effect. Some of the false understandings present in general public are (Quadara, et. al., 2013):

- Increased expectations of forensic evidence presence at trial;
- Overly trustworthy of forensic evidence and its higher expectations than from other evidence types;
- Incomprehensiveness of the forensic evidence meaning itself;
- Overly biased by articulate court experts (referred to as “White Coat Syndrome”).

Peterson (1974) analysed evidence screening model which consisted of eight decision stages:

1. Decision to intervene in a crime.
2. Decision to process a crime formally.
3. Decision to request a forensic evidence specialist.
4. Decision of forensic evidence specialist to respond.
5. Decisions during investigation at the scene.
6. Decision to return evidence for analysis.
7. Decision to submit evidence to laboratory.
8. Decision to accept evidence.

Peterson describes how circumstantial factors shape verdicts - the speed of notification, weather, the patrol officer and the specialist’s prior experience and learning. The development of forensic databases brought additional stages to be considered (Bradbury & Feist, 2005):

9. Decision to load forensic evidence on to databases.
10. Decision to search databases (contingent on the database and legal context).
11. Decision to follow up a match to accomplish a detection.
12. Decision to proceed with a case at court.

Further forensic research

Traditionally, forensic science research and innovation has mostly been associated with established technologies in other disciplines, such as statistics, chemis-

try, natural science or molecular genetics, where techniques have been developed in detection and analysis. There is a lack of engagement with new technologies. The current research shortage within forensic science, clearly highpoints that unchanged standard is not suitable anymore nor should it be. We have to accept transparent practices and share our knowledge for the benefit of the courts – the judges, attorneys at law, accused, and defendants (Daeid, Cole, & Marra, 2019).

Consequences to mentioned, have prevailed as accidental costs and operational challenges, such as contamination prevention and increased sample complexity. For instance, LCN (Low Copy Number) technique provides a DNA profile to be extracted from a fraction of a nanogram (10^{-9} g) of DNA, and the possibility of contamination that could be given inappropriate importance can also be greatly increased. The results may therefore be misleading, and yet they could be presented as powerful evidence in a courtroom (Nuffield Council on Bioethics, 2007).

Finally, the interpretation and evaluation of forensic evidence and its part in the context of individual criminal case remains at times very challenging, mainly in the absence of sufficient databases. In order to establish unusualness at a crime scene, first we must recognise what is normal. The databases allow forensic researchers to examine and authorise current and developing technologies. This should be required in order to understand the importance of evidence recovered from crime scene (Daeid, Cole, & Marra, 2019).

Further forensic steps in court

It is clear that forensic advances have not yet proved to be a universal solution that will resolve the challenges faced in crime investigations. Until now, research studies have been limited when dealing with the impact of forensic evidence in the crime investigation (Home Office, 2016). As mentioned previously, forensic evidence is only processed in some criminal cases, partially due to its availability during investigation (Burrows, et al., 2005).

Even though, forensic evidence has become an essential element of the criminal justice system, our knowledge is quite limited as regards how forensic evidence contributes to decisions in case processing at various stages. For example, do different types of forensic evidence (e.g. physical injuries vs. DNA or chemical trace analyses) or different assessments by forensic specialists concerning the evidence meaning, influence decisions to proceed with building a criminal case, engaging the suspect, and referring the case to prosecuting attorneys? How do central factors such as socio-culture, investigation leadership, risk management and resources influence the uses to which forensic evidence is put in lawyers' decision-making? (Julian, et al., 2011; Quadara, et. al., 2013).

CONCLUSION

Crime is declining, but it is also changing. The evidence-based research and the discussions about the collaboration between forensic science and the criminal law presents an uncertain scenario with regard to what the role of forensic evidence in criminal prosecutions is, and what it should be. It is important to have a clear idea what this role entails, because the collection and analysis of forensic evidence is resource intensive (Home Office, 2016; Quadara, et. al, 2013).

Some of the more exciting research developments that will contribute to improving the efficiency and effectiveness of the stream of forensic processes will be the greater use of data mining approaches. This may provide further ideas for defining the inter-relationships between different forensic sub-processes, main stages of attrition, the places with existing blockages and how they can be overcome or ameliorated with the greatest impact on outcomes (Bradbury & Feist, 2005).

At the beginning of the forensic process, the individual performance of crime scene examiners appears to differ; exactly why individual performance varies, or what occurs to detection rates if crime scene examiners take higher investigative role, is still uncertain. The lacking statistical connection between forensic attendance and retrieval rates has long been a segment of analysis in establishing the level of attrition. What sort of factors contribute to higher rates of forensic retrieval (and successful identification) requires to be more clearly identified.

Not all recovered forensic materials are submitted for further analysis (or for subsequent loading on forensic databases). There is a variety of reasons why attrition occurs during retrieval and submission, commonly from the poor quality of the recovered forensic evidence or financial limits on what can be submitted for analysis (Bradbury & Feist, 2005).

And finally, we have limited knowledge regarding contribution of forensic evidence in court. Further studies should focus on how forensic evidence is received and heard by the court; how it is led as being relevant to the elements of the offence or to specific facts in issue; and the basis upon which it is challenged by the defence (Quadara, et al., 2013).

Forensic evidence is not a sole factor that can predict case progression or positive legal outcomes. Quadara and colleagues (2013) and Lievore (2004) stated that there are complex interactions between various factors, together with forensic evidence, which investigators and prosecutors evaluate through the means of discretion and convictability.

REFERENCES

13. Bradbury, S. A., & Feist, A. (2005). *The use of forensic science in volume crime investigations: a review of the research literature*. London: Home Office Online Report 43/05.
14. Briody, M. (2002-03). The effects of DNA evidence on sexual offence cases in court. *Current Issues in Criminal Justice* 14 (2), 159-181.
15. Burrows, J., Hopkins, M., Hubbard, R., Robinson, A., Speed, M., & Tilley, N. (2005). *Understanding the attrition process in volume crime investigations*. London: Home Office Research, Development and Statistics Directorate.
16. Burton, M., McLeod, R., de Guzmán, V., Evans, R., Lambert, H., & Cass, G. (2012). *Understanding the progression of serious cases through the Criminal Justice System Evidence drawn from a selection of casefiles*. Ministry of Justice.
17. Daeid, N. N., Cole, C., & Marra, M. (2019, May 3). *Lords inquiry says forensic science is broken: here's how we can start to fix it*. Retrieved May 6, 2019 from <https://theconversation.com/lords-inquiry-says-forensic-science-is-broken-heres-how-we-can-start-to-fix-it-116456>
18. Fisher, B. A. (2016). Moving Toward New Requirements for the Admissibility of Evidence. *Forensic Science Policy & Management: An International Journal*, 51-53.
19. Haesler, A. (2006). Dealing with DNA in court: Its use and misuse. *Judicial Review*, 121-144.
20. Hester, M. (2005). Making it through the Criminal Justice System: Attrition and Domestic Violence. *Socila Policy & Society volume* 5, 79-90.
21. Home Office (2016). *Forensic Science Strategy : A national approach to forensic science delivery in the Forensic science strategy: a national approach to forensic science delivery in the criminal justice system*. London: H M Government.
22. Ivanović, A. R., & Ivanović, A. B. (2013). Forenzička akreditacija – pouzdan način dokazivanja / Forensic accreditation – a sure way of proving. *Zbornik radova: VII naučna konferencija sa međunarodnim učešćem – Kriminalistički i krivično-procesni aspekti dokaza i dokazivanja* (pp. 352-364). Sarajevo: Internacionalna asocijacija kriminalista.
23. Julian, R., Kelty, S., Roux, C., Woodman, P., Robertson, J., & Davey, A. (2011). What is the value of forensic science? An overview of the effectiveness of forensic science in the Australian criminal justice system project. *Australian Journal of Forensic Sciences* 43 (4), 217-229.
24. Leane, M., Ryan, S., Fennell, C., & Egan, E. (2001). *Attrition in Sexual Assault Offence Cases In Ireland: A Qualitative Analysis*. Dublin: Department of Justice, Equality and Law Reform.
25. Lievore, D. (2004). *Prosecutorial decisions in adult sexual assault cases: An Australian study*. Canberra: ACT: Australian Institute of Criminology.

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26. Lovett, J., & Kelly, L. (2009). *Different systems, similar outcomes? Tracking attrition in reported rape cases across Europe*. London: Child and Women Abuse Studies Unit, London Metropolitan University.
 27. National Academy of Sciences (2009). *Strengthening forensic science in the United States: A path forward*. Washington, DC: National Academy of Sciences .
 28. Nuffield Council on Bioethics, N. C. (2007). *The Forensic Use of Bioinformation: Ethical Issues*. London.
 - 29.
 30. Peterson, J. L. (1974). *The Utilization of Criminalistics Services by the Police: an analysis of the physical evidence recovery process*. Washington DC: US Department of Justice.
 31. Peterson, J. L., Sommers, I., Baskin, D., & Johnson, D. (2010). *The role and impact of forensic evidence in the criminal justice process*. Washington, DC: U.S. Department of Justice, National Institute of Justice.
 32. Quadara, A., Fileborn, B., & Parkinson, D. (2013). *The role of forensic medical evidence in the prosecution of adult sexual assault*. Melburn: VIC : Australian Centre for the Study of Sexual Assault, Australian Institute of Family Studies.
 33. Schroeder, D. A., & Elink-Schuurman-Laura, K. (2017). *The Impact of Forensic Evidence on Arrest and Prosecution*. West Haven: National Criminal Justice Reference Service, Office of Justice Programs.